

CLAIMS

What Is Claimed Is:

1. A method of concealing missing packets in a CVSD packet stream, the method comprising:
 - receiving an indication from a packet loss indicator that a packet is missing;
 - determining a status of the missing packet;
 - generating a sample packet to replace the missing packet; and
 - storing a compressed copy of the sample packet in a first memory buffer.
2. A method as in Claim 1, wherein the compressed copy of the sample packet is stored in the first memory buffer in μ -law format.
3. A method as in Claim 1, wherein the compressed copy of the sample packet is stored in the first memory buffer in a-law format.
4. A method as in Claim 1, wherein the step of determining the status of the missing packet further comprises:
 - determining that a current packet is missing; and
 - determining that a previous packet, which immediately precedes the current packet, is not missing.
5. A method as in Claim 4, wherein the step of generating a sample packet to replace the missing packet further comprises:

storing a sign value to be used in estimating a pitch value in a second buffer;
estimating a pitch value using a sign based cross correlation algorithm; and
performing pitch synchronous repetition with an overlap-add function using
samples of the previous packet to produce the sample packet.

6. A method as in Claim 1, wherein the step of determining the status of missing
packet further comprises:

determining that the missing packet is a current packet; and
determining that a previous packet, which immediately precedes the current
packet, is missing.

7. A method as in Claim 6, wherein the step of generating the sample packet to
replace the missing packet further comprises:

performing pitch synchronous repetition while applying attenuation.

8. A method as in Claim 1, wherein the step of determining the status of the
missing packet further comprises:

determining that a current packet is not missing; and
determining that a previous packet, which immediately precedes the current
packet, is missing.

9. A method as in Claim 8, wherein the step of generating the sample packet to
replace the missing packet further comprises:

replacing the current packet with an overlap-add function using samples of the previous packet to produce the sample packet.

10. An apparatus for concealing packets missing in a CVSD data stream, the apparatus comprising:

means for decoding the CVSD data stream, the means for decoding the CVSD data stream including means for receiving an indication from a packet loss indicator that a packet is missing in the CVSD data stream;

means for storing a compressed copy of a sample packet coupled to the means for decoding the CVSD data stream;

means for compressing the sample packet coupled to the means for storing the compressed copy of the sample packet; and

means for generating a sample packet to replace the packet missing in the CVSD data stream, the means for generating a sample packet coupled to the means for compressing the sample packet, and including means for determining a status of the missing packet, the means for generating a sample packet further including means for updating the means for storing a compressed copy of a sample packet whenever a sample is generated.

11. An apparatus as in Claim 10, wherein the means for determining the status of the missing packet further comprises:

means for determining whether or not the missing packet is a current packet; and

means for determining whether or not a previous packet immediately preceding the current packet is missing coupled to the means for determining whether or not the missing packet is a current packet.

12. A method as in Claim 11, wherein when the means for determining the status of the missing packet determines that the missing packet is the current packet and that the previous packet is not missing, the means for generating the sample packet to replace the missing packet, is configured to:

store a sign value to be used in estimating a pitch value in a second buffer;
estimate the pitch value using a sign based cross correlation algorithm; and
perform pitch synchronous repetition with an overlap-add function to generate the sample packet.

13. An apparatus as in Claim 11, wherein when the means for determining the status of the missing packet determines that the missing packet is a current packet, and that a previous packet immediately preceding the current packet is missing, the means for generating the sample packet is configured to perform pitch synchronous repetition while applying attenuation.

14. An apparatus as in Claim 11, wherein when the step of generating a sample to replace the missing packet determines that the current packet is not missing, and that a previous packet immediately preceding the current packet is missing, the means for generating the sample packet is configured to:

store a sign value to be used in estimating a pitch value in a second buffer;
estimate the pitch value using a sign based cross correlation algorithm; and
replace the entire current packet with an overlap-add function using samples of
the current packet to generate the sample packet.

15. An electronic communication device, comprising:

a CVSD decoder coupled to receive and decode CVSD encoded packets of
audio data within a CVSD bitstream;

an encoder coupled to the CVSD decoder and configured to encode sample
replacement packets in μ -law or a-law format;

a packet loss concealment (PLC) unit coupled to the encoder, and configured to
pass uncorrupted ones of the received packets to an audio output unit, and to
generate sample packets to replace missing ones of the received packets;

a packet loss indicator (PLI) coupled to the CVSD decoder and to the PLC, the
PLI configured to determine that ones of packets are missing from the CVSD
bitstream, the PLI further configured to output a signal having a value of zero if a
current packet is missing and to output a signal having a value of one if a current
packet is not missing;

a first memory buffer coupled to the CVSD decoder and configured to store
sample packets of audio data used in pitch synchronous repetition; and

a second memory buffer coupled to the CVSD decoder and configured to store
sign values to be used in an estimation of pitch value.

16. A electronic communication device as in Claim 15, wherein the PLC unit is further configured to update the first and second memory buffer when a sample packet of audio data is generated.

17. An electronic communication device as in Claim 15, wherein the sample packets of audio data, stored in the first memory buffer, are stored in compressed μ -law format.

18. An electronic communication device as in Claim 15, wherein the sample packets of audio data, stored in the first memory buffer, are stored in compressed a-law format.

19. An electronic communication device as in claim 15, wherein when the packet loss indicator determines that the missing packet is the current packet and that a previous packet is not missing, packet loss concealment unit is configured to:

- store a sign value to be used in estimating a pitch value in a second buffer;
- estimate the pitch value using a sign-based cross-correlation algorithm; and
- perform pitch synchronous repetition with an overlap-add function using samples from the previous packet to generate the sample packet.

20. An electronic communication device as in claim 15, wherein when the packet loss indicator determines that the current packet is not missing and that a previous packet is missing, the packet loss concealment unit is configured to:

store a sign value to be used in estimating a pitch value in a second buffer;
estimate the pitch value using a sign-based cross-correlation algorithm; and
replace the entire current packet with an overlap-add function using samples
from the current packet to generate the sample packet.

21. An electronic communication device as in claim 15, wherein when the packet loss indicator determines that the current packet is missing and that a previous packet immediately preceding the current packet is missing, the packet loss concealment unit is configured to replace the missing packets using a pitch synchronous repetition method while applying attenuation.

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